

Claims

1 1. A method of making a fiber pitch binder comprising the steps of:

2 (a) providing a pitch having a viscosity of about 0.1 to about 5 poise;

3 (b) providing carbon fibers in an amount of about 0.5 to about 10.0 wt.% of
4 said pitch; and

5 (c) admixing said fibers and said pitch to disperse said fibers into a fiber pitch
6 binder.

1 2. The method of claim 1 wherein step (a) comprises providing a pitch having a
2 viscosity of about 0.1 to about 5 poise at a temperature of about 260° to about
3 140°C.

1 3. The method of claim 1 wherein in step (c) said fibers are substantially
2 dispersed into substantially single mono-filaments which are randomly oriented
3 within the fiber pitch binder.

1 4. The method of claim 1 wherein step (b) comprises providing carbon fibers in
2 an amount of about 5 wt.% of said pitch.

1 5. The method of claim 1 wherein step (b) comprises providing an amount of
2 carbon fibers having a length of about 6 to about 30 mm.

1 6. The method of claim 5 wherein step (b) comprises providing an amount of
2 carbon fibers containing sizing.

1 7. The method of claim 1 wherein in step (b) said fibers are added to said pitch
2 without a substantial amount of a filler.

1 8. The method of claim 1 wherein step (a) comprises providing an amount of
2 pitch derived from coal tar.

1 9. The method of claim 1 wherein step (a) comprises providing an amount of
2 pitch derived from petroleum feedstock.

1 10. The method of claim 1 wherein step (c) comprises admixing said fibers and
2 said pitch by heating said fibers and said pitch to a temperature wherein said pitch
3 has a viscosity of less than about 5 poise, followed by stirring at about 100 to about
4 1000 rpm for a sufficient time such that said fibers are substantially dispersed into
5 substantially single mono-filaments which are randomly oriented within the fiber
6 pitch binder.

1 11. The method of claim 1 wherein upon substantial completion of step (c), the
2 fiber pitch binder has a softening point of about 90°C to about 200°C, a MCC value
3 of about 50 to about 75%, and a viscosity of about 1 to about 50 poise at about
4 160°C.

1 12. A method of making a fiber pitch binder comprising the steps of:
2 (a) providing a pitch having a viscosity of about 0.1 to about 5 poise;
3 (b) providing an amount of carbon fibers; and
4 (c) admixing said fibers and said pitch to homogeneously disperse said fibers
5 into a fiber pitch binder such that said fibers are dispersed into substantially
6 substantially single mono-filaments which are randomly oriented within the fiber binder
7 pitch.

1 13. The method of claim 11 wherein step (b) comprises providing carbon fibers
2 in an amount of about 5 wt.% of said pitch.

1 14. The method of claim 11 wherein in step (b) said fibers are added to said pitch
2 without a substantial amount of a filler.

1 15. A pitch based binder comprising an admixture of pitch having a viscosity of
2 about 0.1 to about 5 poise at a temperature of about 260 to about 140°C with 0.5 to
3 about 10.0 wt.% of carbon fibers based on a weight of said pitch, substantially
4 homogeneously dispersed within said pitch as substantially single mono-filaments
5 which are randomly oriented.

1 16. The pitch based binder of claim 15 wherein said admixture has a softening
2 point of about 90 to about 200°C, a MCC value of about 50 to about 75% and a
3 viscosity of about 1 to about 50 poise at about 160°C.

1 17. The pitch based binder of claim 15 wherein said admixture has substantially
2 similar rheological behavior as said pitch.

1 18. A method of forming a carbon body comprising the steps of:

2 (a) providing a binder comprising an admixture of pitch having a viscosity of
3 about 0.1 to about 5 poise at a temperature of about 260 to about 140°C and
4 about 0.5 to about 10.0 wt.% of carbon fibers based on a weight of said
5 pitch, substantially homogeneously dispersed within said pitch as
6 substantially single mono-filaments which are randomly oriented;

7 (b) providing a filler;

8 (c) mixing said binder having said carbon fibers substantially homogeneously
9 dispersed as substantially single mono-filaments which are randomly oriented
10 with said filler to produce a binder-filler mix;

11 (d) shaping said binder-filler mix to form a shaped body; and

12 (e) carbonizing said shaped body to form a carbon body.

1 19. The method of claim 18 wherein step (a) comprises providing a binder
2 having a softening point of about 90 to about 200°C, a MCC value of about 50 to
3 about 75%, and viscosity of about 1 to about 50 poise at about 160°C.

1 20. The method of claim 18 wherein in step (a) said pitch is derived from coal
2 tar.

1 21. The method of claim 18 wherein in step (a) said pitch is derived from
2 petroleum feedstock.

1 22. A carbon body having a substantially homogenous distribution of carbon
2 fibers dispersed within said carbon body as substantially single mono-filaments
3 which are randomly oriented, said carbon fibers present in an amount of about 1.5
4 to about 3.0 wt.% based on a weight of said carbon body.

1 23. A method of making a graphite body having a reduced coefficient of thermal
2 expansion comprising the steps of:

- 3 (a) providing a binder comprising an admixture of pitch having a viscosity of
4 about 0.1 to about 5 poise at a temperature of about 260 to about 140°C and
5 about 0.5 to about 10.0 wt.% of carbon fibers based on a weight of said
6 pitch, substantially homogeneously dispersed within said pitch as
7 substantially single mono-filaments which are randomly oriented;
- 8 (b) providing a filler;
- 9 (c) mixing said binder and said filler to produce a binder-filler mix having a
10 substantially homogenous dispersion of carbon fibers which are randomly
11 oriented throughout;
- 12 (d) extruding said binder-filler mix to form a carbon body;
- 13 (e) carbonizing said carbon body; and
- 14 (f) graphitizing said carbon body to form a graphite body.

1 24. The method of claim 23 wherein step (f) comprises graphitizing said carbon
2 body to form a graphite body having carbon fibers substantially homogeneously
3 dispersed throughout said graphite body as substantially single mono-filaments of a
4 random orientation.

1 25. The method of claim 23 wherein step (f) comprises graphitizing said carbon
2 body to form a graphite body having about 1.5 to about 3.0 wt.% carbon fibers
3 based on a weight of said graphite body, substantially homogeneously dispersed
4 throughout said graphite body as substantially single mono-filaments of a random
orientation.

26. A graphite body having a substantially homogenous distribution of carbon
fibers dispersed within said graphite body as substantially single mono-filaments of a
random orientation, said carbon fibers present in an amount of about 1.5 wt.% to
about 3.0 wt.% based on a weight of said graphite body.

27. A graphite body having a longitudinal coefficient of thermal expansion of
about $-0.5 \times 10^{-6}/^{\circ}\text{C}$ to about $0.10 \times 10^{-6}/^{\circ}\text{C}$ as measured from about 25 to about
200 $^{\circ}\text{C}$.

28. A graphite body having a substantially homogenous distribution of carbon
fibers dispersed within said graphite body as substantially single mono-filaments of a
random orientation, said carbon fibers present in an amount of about 1.5 wt.%
based on a weight of said graphite body.

1 29. A graphite body produced by a method of:

- 2 (a) providing a binder comprising an admixture of pitch having about 0.5 to
3 about 10.0 wt.% of carbon fibers based on a weight of said pitch,
4 substantially homogeneously dispersed within said pitch as substantially
5 single mono-filaments of a random orientation;
- 6 (b) providing a filler;
- 7 (c) mixing said binder and said filler to produce a binder-filler mix having a
8 substantially homogenous dispersion of carbon fibers which are randomly
9 oriented throughout;
- 10 (d) extruding said binder-filler mix to form a carbon body;

11 (e) carbonizing said carbon body;

12 (f) graphitizing said carbon body to produce said graphite body having about
13 1.5 to about 3.0 wt.% carbon fibers based on a weight of said graphite body,
14 said fibers dispersed throughout said graphite body as substantially single
15 mono-filaments of a random orientation.

1 30. A graphite body produced by a method of:

2 (a) mixing a binder comprising an admixture of pitch having a viscosity of
3 about 0.1 to about 5 poise at a temperature of about 260 to about 140°C and
4 about 0.5 to about 10.0 wt.% of carbon fibers based on a weight of said
5 pitch, said fibers substantially homogeneously dispersed within said pitch as
6 substantially single mono-filaments of a random orientation, with a coke filler
7 to form a binder-filler mix;

8 (b) extruding said binder-filler mix to form a carbon body;

9 (c) carbonizing said carbon body;

10 (d) graphitizing said carbon body to produce said graphite body having about
11 1.5 to about 3.0 wt.% carbon fibers based on a weight of said graphite body,
12 said fibers dispersed throughout said graphite body as substantially single
13 mono-filaments of a random orientation.